WE CLAIM:

1. A wireless communications device for transmitting signals in a first plurality of transmit frequency bands and for receiving signals in a second plurality of receive frequency bands, the wireless communications device comprising:

an antenna for transmitting signals to and receiving signals from a wireless communications network; and

an adjustable matching network selectively connecting the antenna to a select one of a third plurality of transmit power amplifiers corresponding to the first plurality of transmit frequency bands for signal transmission, the adjustable matching network matching an impedance of the antenna to the select one transmit power amplifier.

2. The wireless communications device of claim 1, wherein the adjustable matching network selectively connects the antenna to a select one of a fourth plurality of receive bandpass filters corresponding to the second plurality of receive frequency bands for signal reception, the adjustable matching network matching the impedance of the antenna to the select one receive bandpass filter.

3. The wireless communications device of claim 1, wherein the first plurality of transmit frequency bands is equal to the second plurality of receive frequency bands.

4. The wireless communications device of claim 1, wherein the third plurality of transmit power amplifiers is less than the first plurality of transmit frequency bands, with at least one transmit power amplifier operating in at least two transmit frequency bands.

5. The wireless communications device of claim 1, wherein the adjustable matching network comprises a transmit band matching network for each of the first plurality of transmit frequency bands, each of the transmit band matching networks connected to a respective one of the third plurality of transmit power amplifiers and selectively connectable to the antenna, wherein each of the transmit band matching networks are configured to optimize antenna impedance matching for its corresponding transmit frequency band.

6. The wireless communications device of claim 2, wherein the adjustable matching network comprises a switch selectively connecting the antenna to either (a) one of the third plurality of transmit power amplifiers, or (b) one of the fourth plurality of receive bandpass filters, the switch operating during frame periods of a Time Division Multiple Access signal format associated with the wireless communications network.

7. The wireless communications device of claim 6, wherein the switch comprises either a Gallium Arsenide field effect transistor switch or a PIN diode switch.

8. The wireless communications device of claim 1, wherein the adjustable matching network comprises a first bank of electromechanical switches selectively connecting the antenna to one of the third plurality of transmit power amplifiers, the first bank of electromechanical switches operational to change the antenna selective connection in response to a change in selection of one of the first plurality of transmit frequency bands.

9. The wireless communications device of claim 8, wherein the first bank of electromechanical switches comprise MicroElectronic Machines.

10. The wireless communications device of claim 2, wherein the adjustable matching network comprises a second bank of electromechanical switches selectively connecting the antenna to one of the fourth plurality of receive bandpass filters, the second bank of electromechanical switches operational to change the antenna selective connection in response to a change in selection of one of the second plurality of receive frequency bands.

11. The wireless communications device of claim 10, wherein the second bank of electromechanical switches comprise MicroElectronic Machines.

12. The wireless communications device of claim 5, wherein the transmit band matching networks comprise a single series inductor and a shunt capacitor.

13. The wireless communications device of claim 2, wherein the adjustable matching network comprises a receive band matching network for each of the second plurality of receive frequency bands, each of the receive band matching networks connected to a respective one of the fourth plurality of receive bandpass filters and selectively connectable to the antenna, wherein each of the receive band matching networks are configured to optimize antenna impedance matching for its corresponding receive frequency band.

14. The wireless communications device of claim 13, wherein the receive band matching networks comprise a single series inductor and a shunt capacitor.

15. The wireless communications device of claim 2, wherein the adjustable matching network comprises:

a variable matching network connected to the antenna; and

a transmit/receive switch having common, receive output and transmit input terminals, and operable between transmit and receive positions, the transmit/receive switch having its common terminal connected to the variable matching network, the transmit/receive switch receive output terminal selectively connectable to a select one of the fourth plurality of receive bandpass filters, and the transmit/receive switch transmit input terminal selectively connectable to a select one of the third plurality of transmit power amplifiers.

16. The wireless communications device of claim 15, wherein the adjustable matching network further comprises a first bank of electromechanical switches connected between the transmit/receive switch transmit input terminal and the third plurality of transmit power amplifiers for selectively connecting the antenna to a select one of the third plurality of transmit power amplifiers, the first bank of electromechanical switches operational to change the antenna selective connection in response to a change in selection of one of the first plurality of transmit frequency bands.

17. The wireless communications device of claim 15, wherein the adjustable matching network further comprises a second bank of electromechanical switches connected between the transmit/receive switch receive output terminal and the fourth plurality of receive bandpass filters for selectively connecting the antenna to a select one of the fourth plurality of receive bandpass filters, the second bank of electromechanical switches operational to change the antenna selective connection in response to a change in selection of one of the second plurality of receive frequency bands.

18. The wireless communications device of claim 15, wherein the transmit/receive switch is operational at a frame rate of a Time Division Multiple Access signal format utilized by the wireless communications network.

19. The wireless communications device of claim 15, wherein the variable matching network comprises step-switched reactances matching an impedance of the antenna to a selected transmit power amplifier.

20. The wireless communications device of claim 19, wherein the step-switched reactances each comprise a plurality of reactances in a binary ratio of reactance value, with each of the plurality of reactances having an associated switch.

21. The wireless communications device of claim 15, wherein the adjustable matching network further comprises:

an impedance mismatch measuring and quantizing unit measuring forward and reflected power of a signal transmitted in a selected one of the first plurality of transmit frequency bands corresponding to a selected one of the third plurality of transmit power amplifiers, and generating signals providing a quantized indication of antenna impedance mismatch; and

a control processing unit receiving and processing the quantized impedance mismatch indication signals and providing adjustment control signals to the variable matching network to adjust the variable matching network to achieve an impedance match of the antenna to the selected transmit power amplifier.

22. The wireless communications device of claim 21, wherein the quantized impedance mismatch indication signals are generated by the impedance mismatch measuring and quantizing unit during a transmit slot of a Time Division Multiple Access frame period.

23. The wireless communications device of claim 21, wherein the control processing unit provides the adjustment control signals to the variable matching network during a portion of a Time Division Multiple Access frame period not used by the wireless communications device for either transmission or reception.

24. The wireless communications device of claim 2, wherein the adjustable matching network comprises:

a transmit/receive switch having common, receive output and transmit input terminals, and operable between transmit and receive positions, the transmit/receive switch having its common terminal connected to the antenna;

a variable receive matching network connected to the receive output of the transmit/receive switch and selectively connected to a select one of the fourth plurality of receive bandpass filters; and

a variable transmit matching network connected to the transmit input terminal of the transmit/receive switch and selectively connected to a select one of the third plurality of transmit power amplifiers.

25. The wireless communications device of claim 24, wherein the adjustable matching network further comprises:

a first bank of electromechanical switches connected between the variable transmit matching network and the third plurality of transmit power amplifiers for selectively connecting the variable transmit matching network to a select one of the third plurality of transmit power amplifiers, the first bank of electromechanical switches operational to change the selective connection in response to a change in selection of one of the first plurality of transmit frequency bands; and

a second bank of electromechanical switches connected between the variable receive matching network and the fourth plurality of receive bandpass filters for selectively connecting the variable receive matching network to a select one of the fourth plurality of receive bandpass filters, the second bank of electromechanical switches operational to change the selective connection in response to a change in selection of one of the second plurality received frequency bands.

26. The wireless communications device of claim 25, wherein the first and second banks of electromechanical switches comprise MicroElectronic Machines.

27. The wireless communications device of claim 24, wherein the adjustable matching network further comprises:

an impedance mismatch measuring and quantizing unit measuring forward and reflected power of a signal transmitted in a selected one of the first plurality of transmit frequency bands corresponding to a selected one of the third plurality of transmit power amplifiers, and generating signals providing a quantized indication of antenna impedance mismatch; and

a control processing unit receiving and processing the quantized impedance mismatch indication signals and providing adjustment control signals to the variable transmit matching network to adjust the variable transmit matching network to achieve an impedance match of the antenna to the selected power amplifier.

28. The wireless communications device of claim 27, wherein the quantized impedance mismatch indication signals are generated by the impedance mismatch measuring and quantizing unit during a transmit slot of a Time Division Multiple Access period.

29. The wireless communications device of claim 27, wherein the control processing unit provides the adjustment control signals to the variable transmit matching network during a portion of a Time Division Multiple Access frame period not used by the wireless communications device for either transmission or reception.

30. The wireless communications device of claim 24, wherein the variable receive matching network includes either a set of fixed matching components for each of the second plurality of receive frequency bands, or step-switched reactances matching an impedance of the antenna to a selected receive bandpass filter in response to switch control signals from a control processing unit.

31. The wireless communications device of claim 24, wherein the variable transmit matching network includes either a set of fixed matching components for each of the first plurality of transmit frequency bands, or step-switched reactances matching an impedance of the antenna to a selected transmit power amplifier in response to switch control signals from a control processing unit.

32. The wireless communications device of claim 30, wherein the control processing unit stores predetermined values for the switch control signals for each of the second plurality of received frequency bands.

33. The wireless communications device of claim 27, wherein the control processing unit inhibits adjustment of the variable transmit matching network when the quantized impedance mismatch indication signals indicate an antenna impedance mismatch within a predetermined limit.

34. A wireless communication device for transmitting and receiving signals in multiple transmit and receive frequency bands using Time Division Multiple Access (TDMA) signal formats, the wireless communications device comprising:

an antenna for transmitting signals to and receiving signals from a wireless communications network;

a transmit/receive switch selectively coupling the antenna to a transmit signal path during a transmit time slot of a frame period of the TDMA signal format, and selectively coupling the antenna to a receive signal path during a receive time slot of the TDMA frame period;

a variable matching network connected in the transmit signal path between the antenna and a selected transmit power amplifier corresponding to a selected transmit frequency band;

an impedance mismatch measuring and quantizing unit connected in the transmit signal path between the selected transmit power amplifier and the variable matching network, the impedance mismatch measuring and quantizing unit measuring forward and reflected power of a signal transmitted on the selected transmit frequency band, and generating mismatch indication signals providing a quantized indication of antenna impedance mismatch, the impedance mismatch measuring and quantizing unit generating the mismatch indication signals during the transmit time slot of the TDMA frame period; and

a control processing unit receiving and processing the mismatch indication signals and providing adjustment control signals to the variable matching network during a portion of the TDMA frame period not utilized by the wireless communications device for transmission.

35. The wireless communications device of claim 34, wherein the adjustment control signals are provided by the control processing unit to the variable matching network during a portion of the TDMA frame period not used by the wireless communications device for reception.

36. The wireless communications device of claim 34, wherein the mismatch indication signals include a first bit indicative of whether a reflection coefficient magnitude developed from the measured forward and reflected power it is less than or greater than a predetermined value.

37. The wireless communications device of claim 36, wherein if the first bit of the mismatch indication signals indicate a reflection coefficient less than the predetermined value, the control processing unit does not provide adjustment control signals to the variable matching network.

38. The wireless communications device of claim 34, wherein the mismatch indication signals provide a coarse indication of reflection coefficient phase.

39. The wireless communications device of claim 38, wherein the mismatch indication signals include a 2-bit quadrant indication portion indicating in which quadrant of a complex plane the reflection coefficient lies.

40. The wireless communication device of claim 39, wherein the 2-bit quadrant indication portion is processed by the control processing unit to output the adjustment control signals from a precomputed look-up table.